4 Watershed Management Goals

4.1 Drinking Water Protection Goals

4.1.1 Water Quality

The enabling legislation that created the Division of Watershed Management directs the DWM "*… to assure the availability of pure water for future generations"*

Water quality in the Wachusett Reservoir depends on many watershed features, including natural characteristics, land use, and hydrology. A major tenet of watershed management is protection through ownership of watershed lands. Owning and managing forest lands surrounding a water supply source is recognized as the most direct and proven method of protecting the sources of long-term water quality. Purchase of land or buffers protects land from development, which is generally accepted as detrimental to water quality. However, there still remain numerous questions and options about managing protected lands in order to produce the best water quality.

The Division of Watershed Management must continually assess the quality of the water, and develop management strategies that assure the availability of clean water. The DWM's overarching Planning Document for Wachusett Reservoir is the Watershed Protection Plan Update for Metropolitan Boston Water System, Wachusett Reservoir 1998. In this plan, DWM defined water quality goals for the system as follows:

Primary Goals for Water Quality

- PREVENT WATERBORNE DISEASE.
- MEET THE SOURCE WATER COLIFORM CRITERION.
- MAINTAIN A HIGH QUALITY SOURCE WATER.

Secondary Goals for Water Quality

- REDUCE/CONTROL NUTRIENT INPUTS TO THE RESERVOIRS.
- REDUCE RISK OF A CHEMICAL OR HAZARDOUS MATERIAL SPILL.
- CONTROL GENERAL POLLUTANT TRANSPORT INTO THE RESERVOIR.

These goals are used to make and evaluate all management decisions. The Division's Environmental Quality Section collects samples from thirty-five stations on twenty-five tributary streams and from five reservoir stations. The water quality data are reviewed as part of the decision making process. Additionally, MWRA has a detailed water quality sampling program beginning at the Cosgrove Intake and throughout the water transmission and distribution systems. These data are used with the Environmental Quality Section's data to continually monitor the reservoir and watershed systems.

4.1.2 Water Yield

In past years, water yield was a concern for the system, and much effort was devoted to developing land management strategies that would increase water yield. The MWRA has devoted considerable efforts to Demand Management, and consequently the overall system demand has significantly decreased since 1988. The MWRA states that demand is projected to remain well below safe yield of the system. Therefore, water quality considerations will drive management decisions, and yield need not be considered at this time.

4.2 Land Protection Goals

4.2.1 Goals for MDC Land Protection

- WORK TO LIMIT LAND USES ON THE WATERSHED TO THOSE THAT DO NOT THREATEN WATER QUALITY.

- PROVIDE CONTROL OVER NON-FOREST LAND USE (E.G., ROADS), THE EFFECTS OF NATURAL EVENTS (E.G., FIRE), AND HUMAN ACTIVITIES THAT THREATEN WATER OR OTHER NATURAL RESOURCES.

Control over harmful activities on the Wachusett watershed is best achieved when the Commonwealth has actual ownership, or other direct control over allowable activities on the land. Thus, MDC has an active land acquisition program geared towards acquiring ownership of, or other rights on, key parcels on the watershed - primarily those near the reservoir and its principal tributaries and wetlands. Once acquired, these lands can then be managed to establish and maintain optimal cover types that provide for the long-term protection of water quality. In some cases, this may involve converting open land to forested cover.

The location, marking, and maintenance of the boundaries of MDC watershed lands are important land protection activities, since clear boundaries allow for better control over illegal activities that could threaten watershed integrity. Effective resolution of boundary encroachments is also an integral part of boundary maintenance.

The control of potentially harmful activities on watershed lands requires a human presence on those lands, both to identify and locate those activities, and to provide effective enforcement of rules and regulations. This presence is provided by MDC personnel, and is a principal responsibility of the MDC Rangers. This presence allows for the timely discovery and resolution of potentially harmful human activities (e.g., illegal dumping) and natural events (e.g., fires) on the watershed.

Effective monitoring and control also depends on a good road system that allows quick access to all parts of the watershed lands. However, since gravel roads also constitute a source of sedimentation caused by erosion into streams and water bodies, watershed road maintenance must be done in ways that minimize these potential adverse impacts.

Finally, land protection goals can sometimes be best served through the designation of "Areas of Special Management Restrictions," on which management and other human activities are restricted. Such designations are especially appropriate on sites where the topography, hydrology, vegetation or other characteristics limit the potential benefits of active management.

4.2.2 Goals for Management of Non-MDC Lands

- ACTIVELY ENCOURAGE PRIVATE LANDOWNERS TO BE PROPER STEWARDS OF THEIR PROPERTIES.
- SET UP COOPERATIVE AGREEMENTS WITH OTHER LAND PROTECTION ENTITIES TO ENSURE WATERSHED PROTECTION.
- CONTINUE TO PURCHASE CONSERVATION RESTRICTIONS WHEN POSSIBLE ON LAND THAT MEETS THE APPROPRIATE CRITERIA FOR PROTECTION.

When sensitive land cannot be purchased in fee, efforts must be made to utilize other means to protect those properties. Educating the public on proper management strategies to protect the lands within the watershed is a Division priority for non-MDC properties. Through M.G.L Ch. 61 (Forestland Tax Law) and the Massachusetts Stewardship Program, the Division has encouraged private landowners to become active stewards by providing resources and assistance in managing their forests and wildlife and by helping them to understand their role in watershed protection.

In 1998, the MDC entered into a Memorandum of Agreement with the Department of Environmental Management concerning the care and protection of lands within the water supply watersheds of the MDC Watershed System. This agreement addresses DEM lands that fall within the MDC watersheds and the cooperative approach to coordinate the management of adjacent lands in order to enhance the protection of water resources. The MDC/DWM will continue to work with other state, municipal and non-profit environmental landowners on agreements to protect land within the watershed.

Conservation Restriction purchases are an alternative to land acquisition by fee. Purchasing a conservation restriction prevents development while allowing the current landowner to retain ownership and use of the land. Conservation Restrictions require annual monitoring to assure compliance with the restriction specifics and with general watershed protection standards.

4.3 Land Management Goals

4.3.1 Wachusett Watershed Forest Management Goals

- PROVIDE A VIGOROUS FOREST COVER, DIVERSE IN SPECIES COMPOSITION AND TREE SIZES AND AGES, ACROSS THE VAST MAJORITY OF THE MDC LANDS.
- MAINTAIN FOREST COVER THAT BALANCES ACTIVE GROWTH AND NUTRIENT ASSIMILATION, DENSE FILTRATION, TEMPERATURE REGULATION, AND ACTIVE REPRODUCTION.
- RETAIN THIS FOREST COVER BY ENCOURAGING AND MAINTAINING ADEQUATE FOREST REGENERATION ACROSS MDC LANDS.
- ENHANCE AND MAINTAIN THE ABILITY OF THE WATERSHED FOREST TO BOTH RESIST AND RECOVER FROM DISTURBANCE.
- PREVENT EROSION OF SEDIMENTS AND NUTRIENTS FROM THE WATERSHED FOREST, AND PROVIDE FOR ACTIVE ASSIMILATION OF AVAILABLE NUTRIENTS.

- LIMIT THE EFFECTS OF HUMAN-CAUSED AIR POLLUTION BY PROVIDING COVER THAT FILTERS AND/OR BUFFERS POLLUTANTS.
- DEVELOP A LOW-MAINTENANCE WATERSHED FOREST, WHICH PROVIDES LONG-TERM WATER QUALITY PROTECTION WITH MINIMAL INTERVENTION.
- CONDUCT ANY FOREST MANAGEMENT ACTIVITY SUCH THAT THE RESULTING BENEFITS OUTWEIGH ANY POTENTIAL NEGATIVE IMPACTS; COMPLY WITH OR EXCEED ALL ENVIRONMENTAL REGULATIONS GOVERNING FOREST MANAGEMENT ACTIVITIES IN MASSACHUSETTS.
- SALVAGE DEAD AND DOWNED MATERIAL IN AREAS WHERE THIS SALVAGE WILL REDUCE THE THREATS OF FIRE OR NUTRIENT TRANSPORT, AND LIMIT THE NEED FOR SALVAGE, THROUGH DELIBERATE MANAGEMENT PRACTICES AIMED AT REDUCING THE LIKELIHOOD OF DAMAGE.

The Division has determined that a diverse, vigorous forest cover should be maintained on the vast majority of its holdings, due to the unequaled water quality protection this cover provides. The chief value of this tree cover is to act as a filter for purifying the water that passes through it. The tall crowns of the forest overstory add depth to this filter and provide temperature regulation of surface, ground, and stream waters. Those portions of the forest that are actively growing and assimilating available nutrients limit the export of these nutrients to the reservoir. The forest understory provides uninterrupted recovery from overstory losses. The forest overstory canopy, the forest understory, the vegetative ground cover, and the thick organic mat of decomposing matter on the forest floor, as well as root systems interspersed within the mineral soil below, all work in concert to produce water of high quality.

In order to retain forest cover through the variety of disturbances that affect that cover, it is a Division goal to expediently establish and retain adequate forest regeneration across the watershed. While the specifics of "adequate regeneration" are addressed later in the plan, the Division believes it is a prudent goal to steadily maintain well-distributed reproduction, so that the forest is capable of quickly recovering from disturbance. In simple terms, the understory represents a "reserve forest," a back-up to cover the eventuality of overstory losses.

A primary goal of Wachusett forest management is to develop a diversity of age-classes, including well-distributed regeneration, in order to reduce the susceptibility of the forest to catastrophic wind damage. While hurricanes are potentially the most disruptive disturbance facing the Wachusett watershed forest, the more frequent occurrence of less dramatic disturbances is also of concern to managers. These include the effects of air pollution, insects and diseases, and changes brought about by smaller scale weather events such as localized windstorms and heavy snow or ice storms. A forest that is diverse in species composition and multi-aged will resist natural impacts and human-caused pollution because these impacts tend to be species and/or size/age specific. Thus, the Division's forest management will "condition" the forest to be able to recover quickly from both localized, endemic disturbances and widespread, catastrophic events, in part by maintaining diversity.

Producing and retaining a diverse forest cover addresses the Division goal to protect the tributaries from undesirable chemical, nutrient, and sediment inputs in a variety of ways. First, this cover reduces the erosion potential of precipitation and minimizes damaging overland flow. It also serves to buffer chemical impacts to water quality by maximizing water contact time with vegetation and soil components. Through the process of evapotranspiration, forests act as water yield "regulators," moderating the potential water yields of watersheds and thereby regulating the loss of nutrients, minerals, and natural elements from the watersheds to the water supply below. Forests that are growing actively accumulate nutrients from the soil, reducing their export to tributaries. Finally, forests likely play an

important role in reducing the effects of human-caused pollution such as acid precipitation, heavy metals, and other environmental pollutants by both buffering impacts and by acting as "sinks" for certain pollutants such as lead.

The Division has concluded that the diversity of species appropriate for watershed management purposes should reflect the basic variation in the landscape and natural site conditions (e.g., soils, topography, water, aspect, slope) found at Wachusett. While a range of tree species may be adequately suited to a given site, the management of species that are unsuited to the site (for example, upland species on wetland sites) does not provide optimal watershed protection. Trees growing off of the sites to which they are physiologically most suited are more susceptible to disease, wind, and other environmental impacts (demonstrated by the declining vigor of many red pine plantations on wet soils). In general, species that are well suited to their sites will grow vigorously over long periods of time, reducing the frequency of mortality and salvage operations. This principle is inherent in the goal of the Division to create a watershed protection forest that requires a minimum of maintenance to achieve its function.

It is a Division goal that any forest management activities on the watershed be conducted in such a way that even if no natural disturbances affect an area, the overall benefits to the resource from the activity still outweigh the potential impacts resulting from the activity itself. All activities have both long- and short-term consequences. In assessing the net costs or benefits of forest management activities, the Division considers both immediate and future impacts. For example, activities such as the cutting and/or removal of trees to deliberately regenerate an area must be controlled such that any short term negative water quality impacts from harvesting will be less than the long term benefits derived from diversifying the forest cover.

When major losses of forest trees occur naturally, it is a goal of the Division to salvage dead and downed materials when such salvage will reduce nutrient export and will decrease the risk of catastrophic fires. Further, by reducing the likelihood of damage requiring salvage, and by maintaining good access to forest areas susceptible to damage, forest management should reduce the difficulty and potential water quality threat of these salvage operations.

4.3.2 Non-Forest Management Goals

- INSURE THAT THE MAINTENANCE OF NON-FORESTED HABITATS HAS NO NEGATIVE IMPACT ON WATER QUALITY, THROUGH THE USE OF STRICT CONSERVATION MANAGEMENT PRACTICES.
- PROTECT AND ENHANCE THIS DIMINISHING HABITAT FOR MANY SPECIES OF WILDLIFE THAT ARE CONSIDERED UNCOMMON, RARE OR UNIQUE ON A REGIONAL OR STATEWIDE BASIS.
- MAINTAIN AN IMPORTANT COMPONENT OF THE AESTHETIC DIVERSITY OF THE LOCAL LANDSCAPE.
- PRESERVE IMPORTANT HISTORICAL AND CULTURAL RESOURCES.

The Division has determined that, although it is imperative to maintain forest cover on the vast majority of its holdings, there is significant and widely diverse value in the presence of non-forested habitats. Through the use of Conservation Management Practices applied on a field-by-field basis, any potential negative impacts to water quality will be avoided in the maintenance of these non-forested areas.

The continuing loss of early successional habitats is of great concern to wildlife managers in Massachusetts. A wide variety of species of plants and animals depend for at least a portion of their

lifecycles on various types of non-forested habitats. The Division recognizes that as the largest owner of land in the Wachusett watershed, it has a responsibility to consider the effects of its land management decisions. The Division has concluded that maintaining a small percentage of its holdings in a non-forested condition has a greater net benefit for rare and uncommon wildlife than the marginal benefit these relatively few acres may provide for water quality protection if converted to forest cover. In addition, these acres of land have significant, if difficult to define, value as an integral component of the aesthetic diversity of the area. They also have value as cultural and historical resources. Many of the fields in the watershed have been in existence since the 1700's and are an important part of the natural heritage of the watershed.

4.4 Wildlife Management Goals

- MITIGATE ADVERSE IMPACTS OF WILDLIFE ON WATER QUALITY, INFRASTRUCTURE, AND OTHER WATERSHED RESOURCES.
- PROTECT UNCOMMON, RARE, AND OTHERWISE SIGNIFICANT WILDLIFE SPECIES AND HABITATS WHEREVER THEY EXIST ON MDC LANDS.
- ASSESS AND MITIGATE IMPACTS OF WATERSHED MANAGEMENT ACTIVITIES ON WILDLIFE THROUGH A PROCESS OF NOTIFICATION, SITE VISITS, REVIEW OF RECORDS AND LITERATURE, AND RECOMMENDATIONS TO APPROPRIATE MANAGEMENT STAFF.
- ACTIVELY MANAGE FOR SELECTED WILDLIFE SPECIES THAT ARE CONSIDERED TO BE UNCOMMON, RARE, OR UNIQUE ON A REGIONAL OR STATEWIDE BASIS.

Wachusett Reservoir's role as a water supply reservoir must be given top priority. Mitigating the potential impacts of roosting birds, aquatic wildlife, and burrowing animals is critical.

Although active wildlife management is not a large part of this plan, the Division recognizes that its management activities may impact certain wildlife species or habitats. It is the Division's goal to avoid adversely impacting significant wildlife species or their habitats. This will be accomplished primarily through inventory and survey work to locate rare species and habitats, proper coordination with MassWildlife's Endangered Species and Natural Heritage Program, and proper precautions using management guidelines and Conservation Management Practices (CMPs).

While directly protecting rare or endangered wildlife will be a priority, the Division recognizes that its management activities have the potential to impact more common wildlife. MDC will assess the impacts of these land management activities on the wildlife communities at Wachusett, and thereby minimize any adverse impacts. This will be accomplished through long-term monitoring programs and an in-house review process for all planned management activities.

On certain portions of the watershed it may be feasible and desirable to proactively manage the habitat for the benefit of wildlife. This level of land management is a step beyond habitat protection and is focussed on either habitats or wildlife species that are rare or of special concern on a regional or statewide basis. Some activities might include prescribed burns to enhance a field or meadow, selective removal of exotic plants, erecting nesting platforms for certain species of birds, or creating brush piles or rock piles in suitable habitat.

4.5 Cultural Resource Protection Goals

- IDENTIFY SIGNIFICANT CULTURAL RESOURCES ON WATERSHED LANDS.
- PREVENT DEGRADATION OF CULTURAL SITES AND RESOURCES.

Cultural resources are fragile and non-renewable. Once destroyed they are gone forever; they cannot be regrown, rebuilt, or repaired. Similar to endangered and threatened species of flora and fauna, the fragility of these resources places a value on them that is difficult to calculate.

Preservation legislation, as well as MDC's Cultural Resource Management program, are designed to ensure that future generations will have the opportunity to understand, appreciate, and learn about the past. The Division is concerned with locating and assessing the condition of both historic and prehistoric cultural resources, and generating plans for protecting those resources that are considered unique or are otherwise significant.

T. Kvker-Snowman

Well-built stone wall, a cultural resource

The Division's Cultural Resource Management Program at Wachusett is adapted from a broader plan that was developed for the agency as a whole in 1990. The original plan was articulated in draft form in an MDC document entitled *Cultural Resource Management Plan: Volume One Management Policies, Operating Procedures & Organization*, by Chief MDC Archaeologist Thomas F. Mahlstedt, 1990. The agency plan has been modified to address the specific requirements and nature of the resources contained on the Division's watershed lands.

4.6 Biodiversity Goals

- MAINTAIN AN UNDEVELOPED, FORESTED CONDITION ON MOST OF THE DIVISION'S LAND HOLDINGS.
- WORK TO IDENTIFY ALL UNCOMMON OR RARE SPECIES PRESENT ON DIVISION LANDS, AND PROVIDE HABITAT CONDITIONS AND LEVELS OF PROTECTION RECOMMENDED FOR PERPETUATING THESE SPECIES.
- WHERE FEASIBLE AND APPLICABLE, AND ON LIMITED ACREAGE, MAINTAIN EARLY SUCCESSIONAL FORESTED AND NON-FORESTED HABITATS ON DIVISION LANDS.
- WORK TO IDENTIFY AND ELIMINATE INVASIVE SPECIES FROM DIVISION PROPERTIES.
- MAINTAIN FOREST RESERVES ON A PORTION OF THE DIVISION'S HOLDINGS.

The Division's greatest single contribution to regional biodiversity is the maintenance and management of large areas of undeveloped, forested habitat. Forests can contribute to soil and water conservation, and provide habitat for a range of indigenous plants and animals, aesthetic values, and recreational opportunities (Norton, 1999). The protection from development that results from MDC/DWM ownership contributes significantly to the long-term viability of a variety of organisms and natural communities.

Rare and uncommon species contribute to the biological complexity of a landscape or region. Efforts to identify and protect rare or endangered species or habitats occur continually on Division land. Future studies to locate and classify rare natural communities may be initiated. Actions to protect and enhance these species and habitats will provide critical protection of important components of biodiversity.

G. Buzzell

Field Habitat at Wachusett

The Division owns several hundred acres of non-forested habitat including abandoned agricultural fields, active and inactive hay fields, and scrub/shrub meadows. A majority of these habitats will be maintained in an early successional stage through mowing and/or the use of fire in order to provide habitat for an array of organisms that depend on non-forested areas. As discussed previously, in order to ensure biological representation of indigenous species, a range of habitat conditions must be present. Early successional forested habitat has been clearly identified as a rare habitat type within the state (MassWildlife, pers. comm., Dettmers and Rosenberg 2000). By its nature, early successional forested habitat is dynamic both spatially and temporally. It must either be continually created or maintained at that successional stage or it will mature into older forest. When possible, even-aged management techniques will be used to create and/or maintain this habitat in selected portions of MDC/DWM holdings.

Invasive species are commonly recognized as a major threat to native flora and fauna and biodiversity. In extreme cases, invading exotics can out-compete and exclude native vegetation, resulting in a monoculture of the invasive plant. The result is a tremendous loss of native plant and associated animal diversity. The Division will strive to identify, control and eliminate invasive species from Division lands, within the limits imposed by water quality protection or limitations of resources and personnel.

The primary reason for incorporating forest reserves into land management planning is to ensure representative examples of biodiversity indigenous to an area are protected (Norton 1999). Forest reserves are important because they contribute to the full range of biodiversity and are important to a wide spectrum of species requiring undisturbed habitat. In addition, forest reserves can act as a reference or "control" site in which to assess the impact of management activities. Further, reserves also provide a different aesthetic opportunity and have a different character than managed forests. The Division has set aside a 213-acre reserve (Poutwater Pond) and will assess the feasibility of creating additional reserves around the watershed.